MANUFACTURE OF RADIAL TIRE

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Abstract of **JP1145135**

PURPOSE:To reduce drastically a value of force variation (FV) by designing and manufacturing in such a way that wave forms respectively based on the molding factor and the vulcanization factor, which may cause the force variation, are compensated each other.
CONSTITUTION:Each of the components of a radial tire has at least a joint portion on one spot in its peripheral direction, the ununiformity in thickness may occur in the joint portion and it may cause force variation (FV). These joints are set to be distributed in such a way that their positions do not neighbor each other and in such positional relation an average wave form of rateral force variation (LFV) is determined. The average wave form which is the molding factor generated when molding the tire and that which is the vulcanization factor generated when vulcanizing the tire are measured in advance. The molded tire is set in a vulcanization mold so as to make the maximum amplitudes of these wave forms to offset each other. The synthetic wave obtained in such a way has a small amplitude and allow the value of LFV to be reduced.
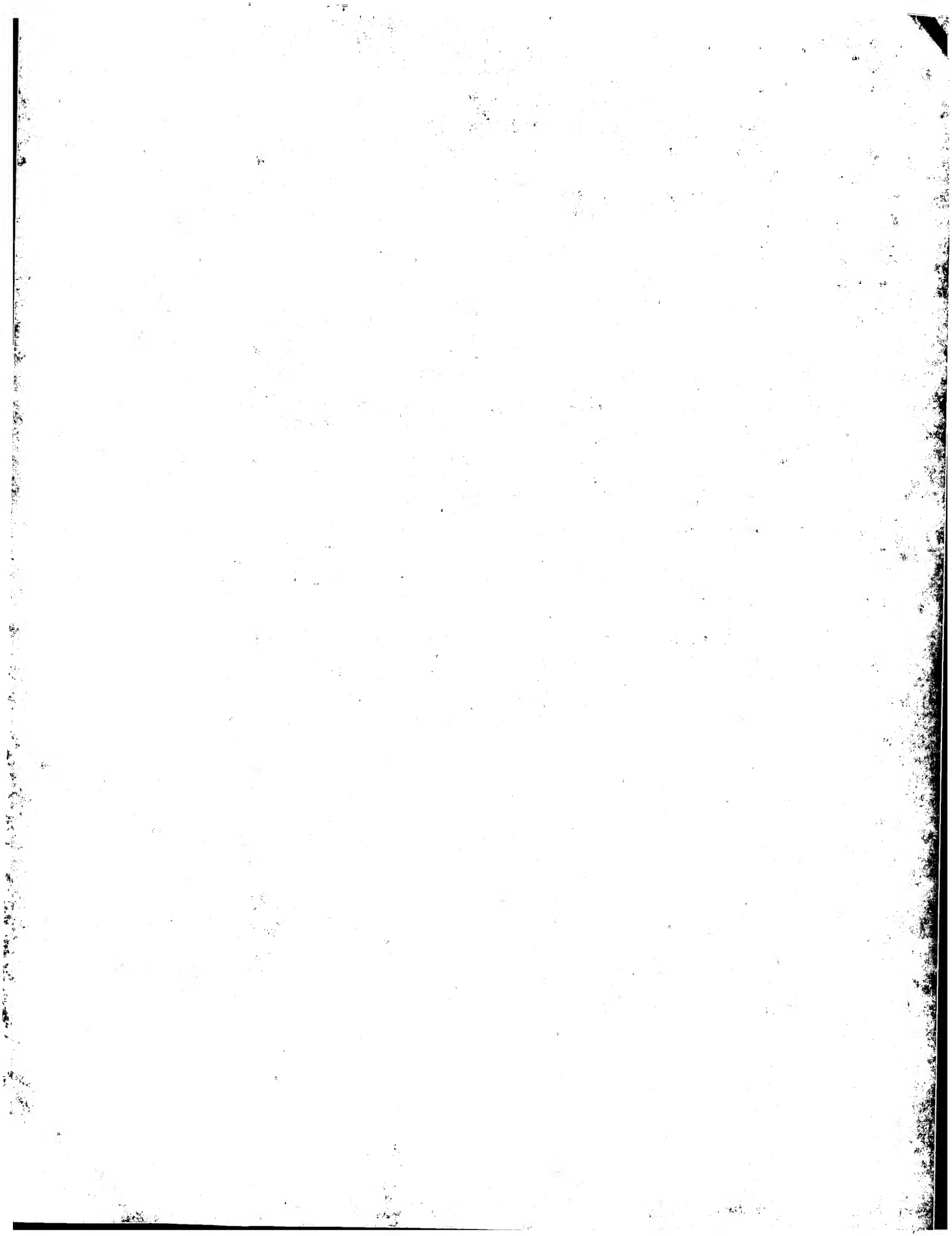
明　細　書

1.　発明の名称　　　ラジアルタイヤの製造方法

2.　特許請求の範囲

(1)　成形要因のLFV平均波形の正又は負の最大振幅位置P1と加硫要因のLFV平均波形の負又は正の最大振幅位置Paの間隔が20°以内になるようにタイヤ成形カバーを加硫モールドに設置し、両者のLFV平均波形を相殺するように合成波を形成することを特徴とするラジアルタイヤの製造方法。

3.　発明の詳細な説明

〔産業上の利用分野〕

　本発明は、ラジアルタイヤのフォースバリエーション（FV）特にラテラルフォースバリエーション（タイヤが平坦な路面を走行する際、路面に対して縦方向に生じる力の変動値）を軽減したタイヤの製造方法に関する。

〔従来技術〕

　空気入りタイヤは多数の構成部材を含み、これらの構成部材の成形に伴う不均一化、あるいはタイヤ加硫時の金型形状等に伴う不均一化により、仕上がりタイヤは一定のフォースバリエーション（FV）が生ずる。このようなタイヤのフォースバリエーションは、車両の乗心地、操縦安定性等に重大な悪影響を及ぼすため、その解決を図ることは従来からの強い要請であるが、その発生要因が複雑であるためその根本的な解決がされていない。
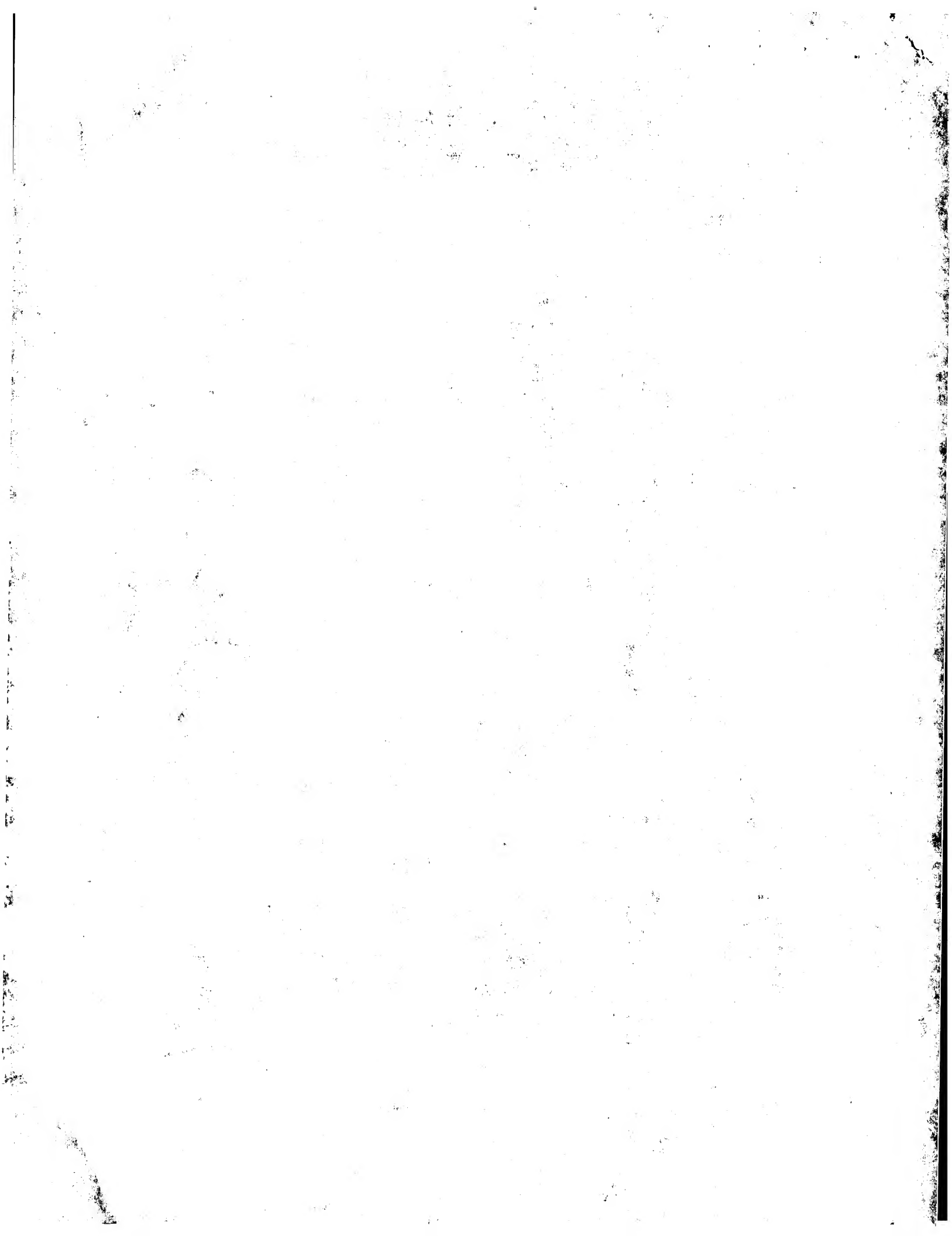
　これまでの解決方法としてはタイヤのトレッド部やショルダー部からゴムを一部研削し、全休のバランスを図るものがあるが、この場合FV値の減少は僅かであるのに対しタイヤの外観を損なう結果となる。

〔解決すべき問題点〕

　本発明は前記問題点を解決するもので、FVの原因となる成形要因と加硫要因に基づく波形を両者相殺するように設計、製造することによりFV値を大巾に軽減することを目的とする。

〔解決手段〕

　本発明は成形要因のLFV平均波形の正又は負

の最大振幅位置と加硫要因のLFV平均波形の負又は正の最大振幅位置の間隔が20°以内になるようにタイヤ成形カバーを加硫モールドに設置し両者のLFV平均波形を相殺するように合成波を形成することを特徴とするラジアルタイヤの製造方法である。

以下本発明の一実施例を図面に基づき説明する。

ラジアルタイヤの基本的な構成部材として一対のビードコアのまわりにその両端を係止されるトロイド状カーカスプライと、そのカーカスプライの外側に配置されるベルト層及びトレッドゴム、更にカーカスプライの両側に配置される一対のサイドウォールゴム、カーカスプライの内側に配置されるインナーライナーゴムを含んでいる。これらの構成部材はタイヤ成形時、夫々タイヤ周方向の少なくとも1ケ所でジョイント部を有し、このジョイント部で構成部材の厚みの不均一化を生じ、これがフォースバリエーションの原因となる。そこでこれらのジョイント部は相互に位置が隣接しないように分散して設定されるが、この位置関係によって本発明のLFV平均波形が決定されることとなる。

第1図ではインナーライナージョイント(IJ)、カーカスプライジョイント(PJ)、サイドウォールジョイント(SJ)、ベルトジョイント(BJ)及びトレッドジョイント(TJ)のタイヤ周方向における位置関係を示しており相互間隔（角度）は夫々α1、α2、α3、α4、α5となるように設定されている。そこで成形タイヤの成形要因波形は次の手順で測定される。

① 外から位置の確認できるIJの位置を加硫モールド内に周方向に45°づつ回転させて、各8本のタイヤを加硫する。

② IJの位置を固定して8本の各タイヤのLFV波形を測定する。

③ 8本のタイヤのLFV波形を平均する。この場合加硫要因は打ち消される。

一方、加硫要因波形は次の手順で測定される。

① 前記加硫タイヤの加硫ステンシルの位置を固定して8本のタイヤのLFV波形を測定する。

② 8本のタイヤのLFV波形を平均する。この場合、成形要因は打ち消される。

タイヤサイズ185SR14のラジアルタイヤについて内圧2kg/cm²で前記の方法で測定した成形要因と、加硫要因の平均LFV波形を第2図、第3図に示す。第2図において成形要因のLFV平均波形はほぼ正弦波を描きその正の最大振幅位置Paは約270°位置にまた2番目に大きい負の振幅位置Pbは約100°位置にあらわれる。一方第3図において加硫要因のLFV平均波形も同様にほぼ正弦波を描き、その負の最大振幅位置P1は約250°位置に2番目に大きい正の振幅位置P2は約80°位置にあらわれる。これらの特性は、成形工程における構成部材のジョイント部の位置設定、及び加硫モールドの特定によってほぼ画一的に決定されることとなる。そこで前記加硫要因及び成形要因のLFV平均波形における正の最大振幅位置と負の最大振幅位置の間隔W1を20°以内になるように加硫ステンシル位置とIJの位置の間隔aを設定する。合成波を形成した状態を第4図に示す。ここでIJ及び加硫ステンシルは、前記平均波形の測定にたまたま採用したもので成形カバー及び加硫モールドの位置を特定できる他の表示を用いてもよいことは勿論である。

なお成形要因及び加硫要因のLFV平均波形は波長が同一になるとは限らないので2番目に大きい振幅位置P1、Pa及びP2、Pbの間隔W1は前記W1の調整によって必ずしも調整できるとは限らない。この場合W1を20°の範囲内で調整することによりP1、Pa及びP2、Pbの合成振幅が最小になるようにすることが必要である。

なお本発明は前記のタイヤ構成材料の一部削除及び一部追加したもの、またこれらの構成材料のジョイント部の周方向位置間隔を任意に変更することにより成形要因LFVの平均波形の振幅及び形状を変更し加硫要因のLFV平均波形とのより有利な合成波形を得ることも可能である。
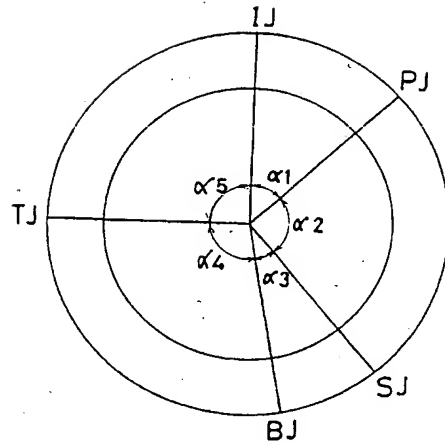
〔発明の効果〕

叙上のごとく本発明はタイヤ成形の際に発生す

る成形要因のＬＦＶ平均波形と、タイヤ加硫の際
に発生する加硫要因のＬＦＶ平均波形を予め測定
しこれらの波形の最大振幅が相互に相殺するよう
に成形タイヤを加硫モールドに設置するものであ
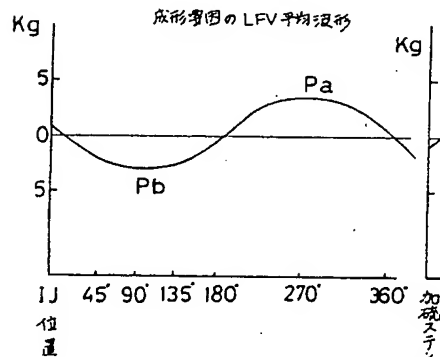り、このようにして得られた合成波は振幅が小さ
く従ってＬＦＶ値の軽減が可能となる。

4.　図面の簡単な説明

　　第1図はジョイント部の位置を示すタイヤ概略
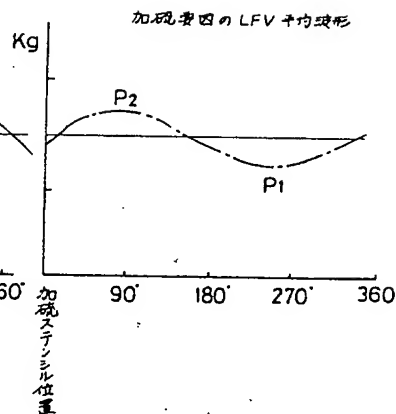図、第2図は成形要因のＬＦＶ平均波形、第3図
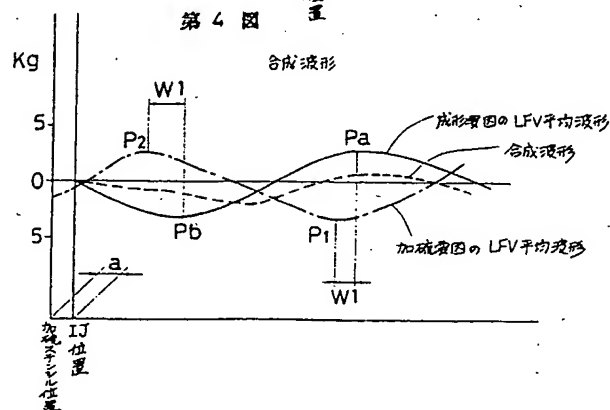は加硫要因のＬＦＶ平均波形、第4図はそれらの
合成波形を示している。

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第 1 図

第 2 図

成形要因の LFV 平均波形

第 3 図

加硫要因の LFV 平均波形

第 4 図

合成波形

Requests for Inspection: Not yet made   No. of Inventions: 1 (3 pages total)

(54) Title of the Invention: A Manufacturing Method for a Radial Tire

[Translator's Note: Personal and place names have been rendered according to the most common reading; other readings are possible.]

Specifications

1. Title of the Invention   A Manufacturing Method for a Radial Tire

2. Claim

(1) We claim a manufacturing method for a radial tire characterized by the fact that a tire formation cover is set up in a vulcanization mold such that the distance between the maximum positive or negative amplitude position P1 of the lateral force variation (LFV) average waveform of the formation factor and the maximum positive or negative amplitude position Pa of the LFV average waveform of the vulcanization factor is within 20°, and a composite wave is formed such that the two LFV average waveforms are offset.

3. Detailed Explanation of the Invention

(Field of Industrial Use)

This invention pertains to a manufacturing method for a tire in which the force variation (FV) of a radial tire and, in particular, the LFV (the fluctuation variable of the force created in the direction vertical to the road surface when the tire is running on an even road surface) is reduced.

(Prior Art)

A pneumatic tire includes many construction elements, and a certain amount of force variation (FV) is created in finished tires as a result of the creation of nonuniformities accompanying the formation of those construction elements or nonuniformities accompanying factors such as mold shape at the time of tire vulcanization. Because such tire force variation greatly affects vehicle ride comfort and operating stability, etc., there have been strong demands to solve this problem for some time. However, due to the complexity of the causes of FV production, the problem has not been fundamentally resolved.

Methods of resolution up to now have been to partially remove the rubber from the tread section and shoulder section of the tire, with the aim of overall balance. However, this results in damaging tire appearance to achieve a slight reduction in FV value.

(Problems To Be Resolved)

This invention solves the above problems and has as its purpose greatly reducing the FV value through design and manufacture such that waveforms based on the formation factor and the vulcanization factor that are the causes of FV are offset.

(Means of Solving the Problem)

This invention is a manufacturing method for a radial tire characterized by the fact that a tire formation cover is set up in a vulcanization mold such that the distance between the maximum positive or negative amplitude position P1 of the LFV average wave form of the formation factor and the maximum positive or negative amplitude position Pa of the LFV average wave formation of the vulcanization factor is within 20°, and a composite wave is formed such that the two LFV average waveforms are offset.

A working example of this invention is explained below based on the figures.

The fundamental construction elements of radial tires include the following: a toroidal core ply in which the two ends are connected surrounding a pair of bead cores; a belt layer that is positioned on the outside of the carcass ply and the tread rubber; a pair of rubbers sidewalls that are positioned on the two sides of the carcass ply; and an inner rubber liner that is positioned on the inside of the carcass ply. During tire formation, these construction elements respectively are joined in at least one place in the tire circumferential direction, which creates a uneven thickness of the construction elements at the joint section and which is a cause of force variation. Accordingly, these joint sections are positioned by being dispersed such that their positions are not mutually adjacent; the LFV average waveform of this invention is determined by the relationships of those positions.

Figure 1 shows the position relationship in the tire circumferential direction of inner tire joint (IJ), carcass ply joint (PJ), side wall joint (SJ), belt joint (BJ), and tread joint (TJ), which are positioned such that the mutual distance (angle) between them is $\alpha 1$, $\alpha 2$, $\alpha 3$, $\alpha 4$, and $\alpha 5$, respectively. Accordingly, the formation factor waveform of the formed tire is measured with the following process:

(1) The position of IJ, which can be confirmed from the outside, is rotated by 45° increments in the circumferential direction in the vulcanization mold, and eight tires are vulcanized.

(2) The position of IJ is fixed, and the LF waveforms of the eight tires are measured.

(3) The LFV waveforms of the eight tires are averaged. In this way, the vulcanization factor is cancelled out.

Meanwhile, the vulcanization factor waveform is measured by the following procedure:

(1) The position of the above-mentioned vulcanized tire vulcanization stencil is determined, and the LFV waveforms of the eight tires are measured.

(2) The LFV waveforms of the eight tires are averaged. In this way, the formation factor is cancelled out.

A formation factor measured with the above method for a size 185SR14 radial tire with an internal pressure of 2 kg.cm^2 and the average LFV waveform of the vulcanization factor are shown in Figures 2 and 3. In Figure 2, formation factor LFV average waveform approximately describes a sine wave, and the positive maximum amplitude position Pa is located at approximately 270° and the second largest negative amplitude position Pb is located at 100°. On the other hand, in Figure 3, the vulcanization factor LFV average waveform also describes the same type of approximate sine wave, and the negative maximum amplitude position P1 is located at approximately 250° and the second largest position amplitude position P2 is located at approximately 80°. These characteristics are almost uniformly determined by setting the position of the composition element joints in the formation process and by specifying the [type of] vulcanization mold. Accordingly, distance a between the vulcanization stencil position and the IF position is set such that distance W1 between the positive maximum amplitude position and the negative maximum amplitude position in the above-mentioned vulcanization factor and formation factor LFV average waveforms is within 20°. Figure 4 shows the shape of the formed composite wave. In the above example, IJ and the vulcanization stencil happened to be used to measure the above-mentioned average waveform, but it goes without saying that other indications can be used to specify the positions of the formation cover and the vulcanization mold.

Furthermore, because the wavelengths of the formation factor and the vulcanization factor LFV average waveforms may not be the same, distance W1 between the second largest amplitude position P1 and Pa, and P2 and Pb cannot necessary be adjusted by adjusting the above-mentioned W1. In that event, it is necessary to minimize the composite amplitude of P1 and Pa, and P2, and P by adjusting W1 to within a range of 20°.

Furthermore, with this invention, the amplitude and shape of the average waveform of the formation factor LFV can be changed by changing, as desired, the materials that are partially added to or deleted from the above-mentioned tire composition elements, as well as the circumferential direction position distance between the joint section of these composition materials, thus making it possible to obtain a more advantageous composite waveform with

the vulcanization factor LFV average waveform by changing the amplitude and shape of the formation factor LFV average waveform.

(Effects of the Invention)

As described above, with this invention, the positive or negative formation factor LFV average waveform of the formation factor LFV average waveform and the vulcanization factor LFV average waveform created at the time of tire vulcanization are measured beforehand, and the formed tire is positioned in the vulcanization mold such that the maximum amplitudes of these waveforms are mutually offset. The composite wave obtained in this way makes it possible to minimize the amplitude and thereby to reduce the LFV value.

4. Brief Explanation of Figure

Figure 1 is an outline drawing of a tire showing the position of the joint sections. Figure 2 shows the LFV average waveform of the formation factor. Figure 3 shows the LFV average waveform of the vulcanization factor. Figure 4 shows the composite waveform of those.

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Figure 1

Figure 2: [at top] LFV Average Waveform of Formation Factor; [at lower left] IJ Position

Figure 3: [at top] LFV Average Waveform of Vulcanization Factor; [at lower left] Vulcanization Stencil Position

Figure 4: [at top] Composite Waveform; [in body, from top] LFV Average Waveform of Formation Factor; Composite Waveform; LFV Average Waveform of Vulcanization Factor; [at lower left, from left to right] Vulcanization Stencil Position; IJ Position